

Demonstration and Assessment of Residential Gas Heat Pump Water Heaters in the Los Angeles Basin

“A robust field demonstration, laboratory evaluation, and market assessment of the newest generation of residential gas absorption heat pump water heaters in the Los Angeles Basin.”

Project Description

This project focused on a field, laboratory, and market evaluation of a “fourth generation” pre-commercial gas heat pump water heater. Five units were installed in single family homes in the Los Angeles Basin and parallel laboratory testing was performed. The results from these efforts were extrapolated with model development in preparation for incorporation into efficiency codes. A market assessment was conducted to identify opportunities for and barriers to market adoption.

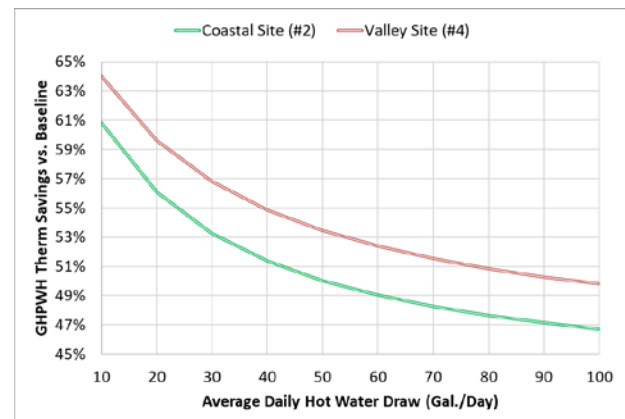


130 therms/yr, and the gas heat pump water heaters consumed approximately 70-80 therms/yr. Compared to a gas storage water heater, the model estimated typical paybacks of 4.5-8 years for a gas heat pump water heater and 1.5-2.5 years compared against an electric storage water heater as baseline.

- **Contractors and homeowners confirmed a strong interest in this new technology class.** Two nationwide surveys were conducted to gauge attitudes, opportunities, and barriers to market adoption of gas heat pump water heaters. The majority of contractors indicated they were very likely to offer the product to their customers (54%) and near-term target demographics were identified.

Key Findings

- **Gas heat pump water heaters showed strong energy savings across the five residential host sites.** The estimated annual average total energy savings amounted to 110 therms per home, which is equivalent an energy savings of 54%, with savings ranging from 23%-67% across sites depending on efficiency of baseline equipment, with the team extrapolating to annual operation (figure).
- **Carbon dioxide (CO₂) emissions reductions were likewise notable.** As compared to baseline water heaters and compared to a higher efficiency gas water heater retrofit (e.g. tankless), the GHPWHs had an average CO₂ emission reduction of 49% and 54% respectively. Additionally, the GHPWHs uses water and ammonia, a natural refrigerant with 0.0 global warming potential and 0.0 ozone depletion potential.
- **Simulation models extrapolated energy, cost, and emissions savings from a range of baseline water heaters and climates across California.** Modeled results for gas storage water heaters showed usage around 200 therms/yr in most climate zones, gas tankless water heaters showed usage around 110-



Benefit for California

- Individual field host sites showed average annual energy savings of about 195 therms/yr and 2,276 lbs CO₂/yr. Assuming a natural gas price of \$1.00/therm and applying a 3% price escalation rate, these savings total \$2,235 over a 10-year period for an individual home.
- Based on the current distribution of gas water heating product types in California and their respective efficiencies, a 10% market penetration of the gas heat pump water heater could yield annual natural gas savings of 90.9 million therms and a reduction of 482,000 metric tonnes of CO₂.